CHEMISTRY

AND

MINERALOGY.

GLAZING FOR COMMON RED EARTHENWARE.

The Large GOLD MEDAL, *being the premium offered, was this Session given to* J. MEIGH *Esq., of Shelton, Staffordshire, for a* GLAZE FOR VESSELS OF COMMON RED EARTHENWARE, *not prejudicial to the health of those who make use of them. Specimens of the Ware, so glazed, and of the glaze itself, as well as of the ingredients of which it is composed, are placed in the Repository of the Society.*

THE common coarse red earthenware is made of brick clay, hence it is very porous: it is also baked at as low a heat as possible, partly in order to save the expense of fuel, and partly, because being made of common clay, which varies considerably in its fusibility, it will not always bear

a high firing, without losing its shape, and becoming unsaleable.

For the reasons above-mentioned it is necessary to employ a glaze, fusible, cheap, and capable of filling up the pores of the ware, so as to enable it to hold fluids, in ordinary use, either as articles of food, or of domestic employment. Litharge, and the common potter's lead ore, are the articles usually employed, the one for the transparent, the other for the black opake glaze. The objections, however, to a glaze wholly or in part composed of lead, are, first, that it cracks when raised rapidly to the temperature of boiling water, on account of the different ratio of expansibility, between the glaze and the clay, and then admits the liquor into the body of the ware; secondly, the glass of lead by itself, or even when mixed in small proportion with earthy substances, is very soluble in vinegar, in the acid juices of the common fruits, and in animal fat when boiling. When such substances, therefore, are cooked in vessels of common red earthenware, a quantity of salt of lead, is formed, which, mixing with the food, produces violent cholics, and all the serious, and often fatal effects that attend the internal administration of the salts of lead.

The discovery of a better and more wholesome glaze, sufficiently cheap to be applied to the common red ware, appeared to the Society to be an important desideratum, and in their opinion this is now effectually supplied by the discovery about to be detailed.

The rock called red marl, is usually in the form of beds of a soft, coarsely slaty structure, and red colour, forming the chief part of the common soil, in many extensive districts in this island, to the N. and W. of a line running obliquely from Durham to Exeter. This marl is easily ground

in water to an impalpable powder, which remains suspended for a considerable time in the fluid. A mixture of this kind is prepared, and the ware, previously well dried, but not burnt, is immersed in it. The superficial pores of the clay are thus filled with fine particles of the marl, and a fit surface is prepared on which to lay the glazing. Being again carefully dried, the ware is ready for the glaze, which is thus composed,

Take 1 part Cornish Granite, consisting chiefly of Felspar,
1 part Glass.
1 part Black Manganese,

the whole well ground together, and diffused in water, to the consistence of cream. Dip the ware in this mixture, and, when thoroughly dry, place it in the kiln and fire it in the usual way. The result will be, a solid black glaze, very permanent, and not containing any ingredients noxious to health. If an opake white glaze is required, omit the manganese.

Mr. Meigh has also employed common marl and the red marl as ingredients of the body of the ware, with excellent effect without increasing its expense; he uses for this purpose, 4 parts of common marl, 1 part of red marl, and 1 part of brick clay. Vessels made of the above mixture, are in possession of the Society. The colour of the body is a reddish cream brown, it is harder, more compact, and less porous than the common red ware; and its general adoption, with the above mentioned glaze, would contribute in no inconsiderable degree to the health of the lower classes, by whom alone the common red ware is used for vessels of cooking.

N° II.

TUSCAN MILL-STONES.

The Large SILVER MEDAL *was this Session given to* HENRY WILLEY REVELEY, *Esq. for his Communication, respecting the nature and preparation of the Stones used in Tuscany, for Grinding fine Flour. Specimens of the Stones have been placed in the Repository of the Society.*

King-street, West, Bryanstone-square,
SIR; Dec. 11th, 1821.

I TAKE the liberty of offering to the Society some specimens of mill-stones, from Tuscany, which I beg you to lay before them on the first convenient opportunity. Having detached them myself from stones of tried quality, I can answer for their being genuine; and such as are most esteemed, and most generally used. From the great difference which exists between these stones and the French burr-stones; and the certainty of their being capable of producing flour equal both in quality and quantity to that afforded by the latter; I presume it might be worth the trouble of ascertaining, if similar stones are to be met with in this country.

The specimens marked No. 1 and No. 2 are used for producing white flour only. No. 1 is from the upper or running mill-stone. It is diallage rock, consisting of

crystals of diallage, imbedded in apparently, compact felspar: both ingredients are so soft as to yield without much difficulty to the knife, but the various position of the crystals of diallage, and their very distinct lamellar structure, always preserve a certain degree of roughness, even after long-continued friction. This rock forms a hill at Prato, a few miles from Florence. The stones, while in the quarry, are first shaped out with a pick, care being taken to make the face of the stone perpendicular to the plane of the bed of the rock; they are then detached by driving in wedges of soft dry wood, between the stone and the adhering mass; finally, water is thrown upon them, which, by increasing their bulk, detaches the stones.

No. 2, is a compact, porcellanous limestone, of a pale flesh colour, and somewhat softer than the diallage rock.

No. 3, is a granular talcose quartz, with imperfect imbedded garnets; it is the material of which both stones are formed for producing brown flour. The only preparation that the corn receives previously to grinding is washing. For this purpose, a basket is sunk into a tub of water, and the corn is slowly poured into the basket: the light grains and dust are thus brought to the surface, and are removed; and the corn having been dried in the air and sun, till it is only very slightly damp, is ready for the miller's use. In this state, less flour is lost in the form of dust, and the grains being somewhat softened externally, the bran is more easily disengaged in broad flakes without any flour adhering.

I shall be happy to communicate to the Society, any more detailed information in my power to give them on this subject. I am, Sir,

A. Aikin, Esq. &c. &c. &c.

Sec. &c. &c. HENRY W. REVELEY.

Description of the Engraving.—Plate VIII.

Fig. 1 represents the face of the under mill-stone prepared for work; the teeth, to possess their utmost perfection, should have the form of the hyperbolic spiral; but, being cut by the hand of the workman without any great regard to mathematical precision, they will, in general, be found to be portions of circles, the locus of the centres of which would be the periphery of a circle of the radius of fourteen inches, described from the centre of the mill-stone. The tool employed to cut the teeth is a double-edged hammer, four inches wide, very sharp, and weighing about twelve pounds; in general, the teeth are as close as possible to each other, but in approaching the eye, they become more rare, deeper and coarser. When the stones are new from the quarry, a few days only are necessary to complete this operation; but when they have been already in use, any able miller's man, wholly unassisted by others or by machinery of any kind, will complete it in the course of twenty minutes. That part of the face which is the real grinding surface (called by the Italians, "*il vero macinante*") extends from six to eight inches from the circumference of the stone. Fig. 2 represents a section of the mill-stones when set to work; the dimension usually preferred, equally for the most powerful mills as for those of inferior strength, is a diameter of four feet, that of the eye being about seven inches. The face of the upper stone is hollowed to a conical surface, the altitude of the cone being about one inch and a half, while that of the lower stone receives a convex form, its surface

approaching to that of a sphere of which the radius is about thirty feet, leaving a distance of about one inch between the centres of the two faces. The deep socket let into the runner, as indicated by fig. 2, is made for the reception of the iron nut placed on the square of the spindle. The runner is balanced, and rendered parallel to the bed-stone, by inserting four small wedges of soft wood, two on each side, between the nut and the bottom of its socket. Figs. 3 and 4 represent the iron nuts and the spindle, with the wooden bush by means of which it is held in the centre of the under mill-stone. The dark part in fig. 1 represents the relative position of the teeth of the upper and under stones, the former turning on the latter in the direction indicated by the arrow, and thus continually comminuting the grain, and driving it at the same time from the centre to the circumference, where it escapes.

Having concluded the description of the drawings, interspersed with some particulars immediately connected with them, I have now to observe, with regard to the specimens of stones which I presented to the Society; that those from which the samples Nos. 1 and 2 were taken, are applied to the grinding of the finer kinds of wheat, from which white bread is made; the combination of the hard runner with the soft bed-stone being peculiarly adapted to grind into fine white flour the central parts only of the grain, leaving the bran broad and clean. It is difficult even by coarse sifting to give a brown tinge to bread made from this flour. The samples No. 3 were taken from that kind of stone, in use for grinding the coarse and harder kinds of corn. Their excellence depends upon that quality which enables them to grind almost the whole of the substance exposed to their action; however carefully the flour produced by this style of grinding may be sifted, the

bread which it produces, although very wholesome and agreeable, is always dark, and in some cases almost black. Provided that these stones possess the essential grinding qualities already specified, they are never deemed too hard; this mode of grinding is essentially economical, for since the quantity of bran which remains after sifting is extremely small, nearly the whole of the grain is converted into flour. HENRY W. REVELEY.

Though from the above particulars stated by Mr. Reveley, it is evident how greatly the system of the Tuscan millers differs from that of the English ones, it may not be improper to state briefly those points of practice which are most at variance in the two modes, and the practical conclusions which may be deduced from them. In England, for fine flour, the hardest French buhrs are employed, and both mill-stones are of the same material; the furrows, or teeth, are in right lines, and the grinding surfaces are flat and parallel to each other; the consequence is, that the grinding is performed partly by grinding, and partly by cutting, so that the bran is more or less torn; and it is found difficult to separate the flour from the bran, without the introduction of what the millers technically call "greys," which are small particles of the darker parts of the corn, ground as fine as the flour itself; and, therefore, not separable by dressing or bolting. The Tuscan method, by combining the hard and soft stones, overcomes this difficulty much more readily; since white flour is produced by means of the same dressing, which, when applied to two hard stones, produces brown flour. The friction of grinding also excites considerable heat, so that the meal comes out sensibly warm to the touch; and it is well known, that flour which has been over heated in grinding,

or technically speaking, has been *killed*, is incapable of making light bread.

In Tuscany, the upper mill-stone is far from hard, and the lower one is still softer; the teeth or furrows are very shallow, and their form is such as to impel the grain towards the circumference, the distance between the stones is also continually lessening in the same direction, so that the grain appears to be ground wholly by friction without any cutting of the bran, and to this the soft state of the corn, from the previous washing, materially contributes. The consequence of this is, that the bran is separated almost wholly by the first sieve, the flour is pure, and not liable to be overheated.

In another point of view, Mr. Reveley's communication is interesting, as showing, that other stones besides French buhr and others of similar quality, are at least equally fit for the use of the miller. The diallage rock has long been known to exist in Cornwall; it is also to be met with at Girvan, in Scotland; and the hyperstene rock recently discovered by Dr. M'Culloch, in the Isle of Sky, judging from the specimens deposited by him at the Geological Society, appears equally fit for the purpose as the diallage rock. Mr. Reveley, during a late visit in Cornwall, discovered considerable masses of diallage rock of good quality, near the village of St. Kevern, not far from Helford. He has also had the good fortune to discover a quarry of porcellanous lime-stone, equal to the Tuscan, at Coleford, in the forest of Dean, in Gloucestershire. From the information of D. Mushett, esq. the proprietor of the quarry, it appears that this bed is of considerable extent, and that quarries may be opened in it at a very easy distance from water carriage.

As the Tuscan method of dressing mill-stones, appears

to possess considerable advantages over the common mode practised in this country, even when applied to French buhrs, the following letter from Mr. Reveley is inserted as an appendix to the preceding communication.

King-street, West, Bryanstone-square,
SIR; 11th November, 1822.

I BEG to acquaint you for the information of the Society, that, about four months since, the Tuscan method of dressing millstones has been applied by me to two pair of French buhrs, at the mills belonging to Messrs. Smith and Co. of the White Chapel distillery.

Since that period, these stones have been constantly grinding according to the new plan; and, I am happy to state, much to the satisfaction of the proprietors.

I am, Sir,

A. Aikin, Esq. &c. &c. &c.

Sec. &c. &c. HENRY W. REVELEY.